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covering the chemistry and bacteriology of the treatment of water and sewage might well be made. In all this work, the investigation should be directed to work along lines leading to some practical application as well as to purely scientific research.

These notes are necessarily somewhat brief. The program for the next year or two, we shall be glad to discuss more fully with the officers engaged in field work, if you desire, as opportunity permits. We feel that there is an ample field of effort open, in which there may be secured results of value to the public health of the Nation.

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MEASLES.¹

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About 10,000 American children died of measles in the year 1920. This does not include a large number who died of broncho-pneumonia, a great number of cases of which, in children, are caused by measles. Approximately 60 per cent of all deaths from broncho-pneumonia occur in children under 5 years of age, a time of life when measles is most likely to occur. But the story of the ravages of this disease is not complete without the mention of the large number of cases of tuberculosis which follow an attack of it. Less frequently inflammation of the ear or the eye may be left behind as a mark of a visitation of this common disease. From a public health standpoint, then, measles is a disease of prime importance.

Long association with a disease breeds a contempt for it, and measles, in common with the other diseases of childhood, has come to be looked upon as an unavoidable accompaniment of youth.

Each autumn when school opens there is an increase in the number of cases of measles, and as the season progresses they gradually increase, and winter frequently sees the disease spreading in epidemic form. Hirsch has collected data of 309 epidemics of measles, and has classified them according to season; summer had 43, autumn had 76, winter had 96, and spring had 94 epidemics.

Measles is a disease of close association; hence its increase during the colder months.

Frequently a child will go to a party and engage in innocent games in which children are brought in close contact with one another. Perhaps among the guests there is one with reddened, watery, eyes, which are sensitive to light. The eyelids are perhaps a little puffy, and the guest has a hard, high-pitched cough. The other children

¹ Revision of Supplement No. 1 to the Public Health Reports, Jan. 24, 1913.

pay no attention to this, and the games go on uninterruptedly. In this way a single child in the beginning stages of measles may easily affect 15 or 20 others. This is frequently the case when kissing games are played.

About 10 days later the children who have exposed themselves to the disease begin to sicken. They, too, have red, watery, sensitive eyes and puffy eyelids. In fact, in rather severe cases the whole face has a rather swollen, puffed appearance. The throat feels parched and a dry, irritating cough increases the discomfort. The child is likely to come home from school feeling drowsy and irritable, not infrequently complains of chilly sensations, and may even have a chill. At night the irritation increases, the child is feverish, the whites of the eyeballs show little red lines upon them, and the little sufferer has the appearance of being just ready to cry.

If the anxious mother takes the child to the window in the morning, raises the curtain, and examines the little one's throat she will see that the hard palate and back of the throat are a dull, angry red. Perhaps there are a few little red spots on the hard palate, and if the mother will look closely at the lining membrane of the cheek she will see some small white-tipped, reddish spots. These are called "Koplik's" spots, and are one of the signs of measles.

The child is kept from school that day, and that night his fever is higher than it was the night before. He rolls and tosses about the bed and wakes up his mother a good many times to ask for a drink of water. This sort of thing continues for 3 or 4 days; then, one morning when the child is having its bath the mother sees some little dusky red spots along the hair line. They look a good deal like flea bites. Within 24 hours this rash is spread over the body and the child looks very much bespeckled and swollen. In from 5 to 7 days the rash begins to fade, and within 3 or 4 days thereafter is entirely gone away, leaving behind a faint mottling of the skin. This is followed by a peeling off of the outer layer of the skin in little bran-like pieces. This process is called desquamation, and lasts about a week or 10 days.

In the meantime the fever has gone away and as soon as the child has finished scaling he is permitted to go out and play with the other children, and before long is back at school. The foregoing is a description of a mild case.

If measles assumes a malignant type, as it sometimes does among the nonrobust, it may be ushered in by convulsions, very high fever, and an excessive development of all the ordinary symptoms, or the rash when it appears, instead of being a good healthy-looking red, may be a bluish-black discoloration which looks like a recent bruise. Broncho-pneumonia, the most common and the most fatal of all the

complications of measles, is very likely to occur. The cough is very painful, and death quickly relieves the sufferer.

The two forms of the disease which have just been cited are in no way exaggerated and unfortunately they are of far too common occurrence. The first child received the infection directly in the harmless games at the party by coming in intimate contact with a child who was just coming down with measles at a time when, according to the researches of Anderson and Goldberger in the Hygienic Laboratory of the United States Public Health Service, the infecting virus is most active. Their work seems to show that the infection does not persist after the fever has gone away.

While all of the severe cases may not be as grave as the one which was cited above, it must be admitted, nevertheless, that bronchopneumonia is the great menace of measles. Fifty-odd years ago Gregory wrote, "I am sure I speak much within bounds when I say that nine-tenths of the deaths by measles occur in consequence of pneumonia." Less frequently there are other complications, and the eyes, ears, the central nervous system, heart, and the skin may, any one of them, suffer. Sometimes there is gangrene at the corners of the mouth, and this may result in death or horrible deformity.

Measles, then, is a serious disease, sparing practically no exposed person who has not had it. In 1846 it attacked the Faroe Islands, and the record of that visitation is both remarkable and instructive. The island had been free from the disease for 65 years, when a Danish cabinetmaker returned from Copenhagen to Thorshavn with the disease. He infected two friends, and the epidemic increased by leaps and bounds, until within a very short time over 6,000 persons out of a population of 7,782 were attacked. Almost every house on the island became a hospital, and the only persons who passed through the visitation unscathed were old inhabitants who had had the disease as children 65 years before. Not a single old person who was not protected by a previous attack and who was exposed to the infection failed to contract the disease.

This is one of the oldest ailments with which man has been afflicted. In fact the word "measles" traces its genealogy back through the German "masern" to the Sanskrit "masura," a word meaning "spots." The writings of the ancient Arabian physicians are replete with mention of this disease. The Italians, who evidently regarded it no more seriously than we do, called it "morbillo," which means "little sickness."

Time and again measles has been widely diffused on Asiatic and European soil, and shortly after the colonization of America it appeared in our Colonies. Many are the quaint records of its visitations, not the least interesting of which is a letter which appeared in the Boston Evening Post, November 12, 1739, entitled "A letter about

good management under the distemper of measles at this time spreading in the country, here published for the benefit of the poor and such as may want help of able physicians." It is signed "Your hearty friend and servant," and the authorship is attributed to Cotton Mather. It is stated that this letter is a reprint of one which Doctor Mather wrote shortly before his death, in 1728..

At present the disease is distributed over the entire habitable globe, from Iceland on the north to Tierra del Fuego on the south. It occurs most often and more severely in the colder months, probably because at such times people are more closely crowded together under more insanitary conditions. When introduced among a people who have never suffered from it before, its ravages are frightful, as in the case of the inhabitants of certain of the Fiji Islands, who, upon being exposed to the infection, fell ill and died by thousands, so that it is estimated that 20,000 deaths occurred in four months. The epidemic ceased only after almost every person on the island had been infected.

In 1917 three States had a death rate from this disease of over 40 per 100,000, and several cities had even a higher rate. The death rate for measles for the registration area of the United States during the period 1911 to 1919 has ranged from 3.9 per 100,000 in 1919 to 14.3 in 1917.

The death rate among those attacked varies from one-half of 1 to 35 per cent. If it is estimated that the death rate is 1 per cent, and the number of deaths from measles in the United States during the year 1920 was 10,000, then it would follow that during that year at least 1,000,000 children suffered from this disease. When it is considered that perhaps 30 per cent of these children were of school age, and that the disease occurs most often during the months of school attendance, then it will be seen that approximately 300,000 children were kept from school from six weeks to two months on account of measles. Leaving out of consideration the death and suffering produced in this way, this is a serious economic loss.

Measles is a frequent accompaniment of war, or any other occasion which brings large numbers of persons together under unhygienic conditions. In fact, measles is one of the most formidable of camp diseases. This fact is well demonstrated by morbidity and mortality statistics of the Civil War. At that time the mortality rate was very high in the general field hospital at Chattanooga, being 22.4 per cent, and in the general field hospital at Nashville it was 19.6 per cent. In 1865 there were 38,000 cases with 1,900 deaths from measles in the Confederate Army. It is reported that during the Brazilio-Paraguayan War an epidemic of measles swept off nearly a fifth of the Paraguayan Army in three months. Measles was a serious hazard to life and efficiency in the mobilization and training camps during the World War.

It is thus seen that measles is many times a very severe disease, one which can not be dealt with lightly, one to which we should not expose our children. The longer one can put off having measles the better, because the younger the child is when it has measles the more likely it is to die, and the more likely it is to suffer severe effects from it even if it does not die. The most fatal period is from 2 to 5 years of age.

A child with measles should be put to bed and kept there as long as it has any fever or cough. The room should be airy, but it should be darkened, because children with measles are very sensitive to light. The bedclothes should be light, because the child is likely to get too warm, kick off the covers, and suffer from the cold. A chilling in this way may predispose to pneumonia. Food should be light and should consist chiefly of nutritious broths, pasteurized milk, soft-boiled eggs, and the like. Iced lemonade will bring comfort to the inflamed throat. The child's eyes should be kept clean; and should the fever get high, the comfort of the little sufferer may be increased by sponging with tepid water and alcohol. Sometimes it is necessary to put an ice bag to the head; but if the child is sick enough to require this, skilled assistance should be summoned.

When the fever and cough have gone, the child may be allowed to be up and about the room, but for a time should not indulge in violent exercise, because there is often some weakening of the heart muscle by the disease. The aim is to allow the heart muscle to regain its normal condition before putting too much strain upon it. The diet should be increased when the fever has gone away, and should include good, plain, strong foods. If there is a tendency to regain weight and strength slowly, the child may be given an increased amount of pasteurized cream or good butter. If the child prefers cod-liver oil, this may be substituted.

The important point about the prevention of the disease is the fact that, judging from the experiments of Anderson and Goldberger above referred to, measles is rarely transmissible after the fever has gone down. Experimenting with monkeys, they found that they were unable to transmit measles from monkey to monkey after the stage of fever had ceased. It used to be thought that the germs of measles were in the scales of skin which were shed at the close of the disease.

It is thought by some that there may be chronic carriers of measles, but this is not at all proved. It is also believed that a discharging ear following measles may be the means of continuing the transmission of the disease. This is not proved. There are on record a large number of instances which seem to point to the fact that under certain conditions a third person may carry the infection from the sick to the well. Transmission of measles to human beings by the lower animals is still unproved.

The cause of measles is not known. A great many scientists have described germs which they believe to be the causal agents, but up to date these have not been positively proved to be the cause of measles. We do, however, know that the infection of measles is one of the most highly communicable infections known to man and is found in the secretions from the nose and throat during the first stages of the disease, therefore, persons suffering with measles should not be allowed to come in contact with well persons until the period of fever has well passed.

Since the disease is known to be spread by the sputum and nasal secretions, the prime measure in the prevention of this disease is to prevent the sputum and nasal secretions from the sick from being taken into the system of well persons. Children with measles should be provided with a quantity of soft paper napkins; and as soon as the napkins become soiled, they should be burned. Children should be taught that they must always hold a handkerchief in front of the mouth while coughing. This is a measure which tends to control the spread of a good many diseases besides measles, because during coughing and sneezing, sputum may be thrown several feet. Everything which has come into contact with measles patients should be sterilized before it is allowed to come in contact with other people or other things which may be handled or used by other people. Bedclothes, napkins, table linen, towels, and the like may be sterilized by boiling. Special dishes, drinking glasses, knives, forks, spoons, etc., should be set aside for the measles patient and carefully sterilized after each using.

When it is known that measles exists in a community, no child having a bad cough should be allowed to come in contact with other children during the first three or four days of the cough.

It is little less than criminal to permit children known to have measles to come in contact with well children. In this connection it may be remarked that while it is generally considered that one attack of measles confers immunity, there are many cases on record of second and third attacks. It is true that the second attacks are usually very mild, but too great reliance should not be placed on this immunity.

Children should be discouraged, as far as possible, from playing games which will permit of an interchange of nasal or mouth secretions. It is the duty of every parent having measles in the home to see to it that it is reported to the public-health authorities. It is equally the duty of parents to see to it that their children do not come in contact with well children during the time when the infection may be transmitted. Measles kills more people in the United States every year than smallpox. You can't kill a child any deadlier with smallpox than you can with measles. It is the duty of private citizens and municipalities to take every known measure for the prevention of the spread of this disease.